tentot crania, the average capacity of which is 75 cubic inches. A cubic inch of brain is estimated to weigh 259.57 grains, and this multiplied by 75 would give, as the whole weight, about 2 lbs. 12 oz. av.

Mr. Bouvé asked Dr. Jackson if he had observed any evidence of metamorphic action in the conglomerate rocks of our coast. He had noticed, by the wayside near Hingham, a blood-red rock, resembling Saugus jasper, which he had suspected to be an altered conglomerate, and yet he had never discovered anything of a slaty or pebbly character about it. A short time since, he had found the locality from which these specimens had been taken, near the Ocean House, and had traced it running into true conglomerate.

Dr. Jackson said that he had often seen this red rock, and had frequently traced it into the slate. In Roxbury, rock pebbles of quartz and granite were to be found adhering closely together without any sign of cement. Chemistry reveals the fact that the surfaces are composed of silicate of lime formed by the action of heat. In the vicinity of certain trap-dykes in Rhode Island, the pebbles are often covered with crystals of specular and magnetic iron, produced by the decomposition of the sesquichloride under the influence of water and heat. Argillaceous minerals, also, in conglomerate are often charged with peroxide of iron. He thought this could not be explained by the simple conduction of heat from trap-dykes, but that, in accordance with D'Aubrèe's theory, superheated water must have been the active agent in the changes alluded to.

Messrs. Francis G. Sanborn and J. T. Rothrock were elected Resident Members.

April 16, 1862.

The President in the chair.

Mr. Scudder read the following communication from Mr. E. S. Morse, of Portland, Maine: —

THE HÆMAL AND NEURAL REGIONS OF BRACHIOPODA. BY EDWARD S. MORSE.

In a paper read before the Boston Society of Natural History, by N. S. Shaler, entitled, "Lateral Symmetry in Brachiopoda," it is as-

sumed that the valves of Brachiopoda occupy an anterior and posterior position in their relations to the animal. Statements are also made to the effect that "Naturalists have very generally failed to find any evidence of bilaterality in their organization," and also that a "fruitful source of trouble has been that Malacologists are acquainted with the arrangement of the valves in Lamellibranchiata before they examine the Brachiopoda, so that they come to consider the latter order with a vague impression that all bivalves must have the shells in a similar relation to the animal."

Such remarks unfortunately do injustice to the labors of our Malacologists, and should be corrected; for, since the researches of Cuvier, and still later Owen and Hancock, naturalists have never doubted the relative position of the two valves of Brachiopoda, which have been considered to bear a dorsal and ventral position to the animal; and it will be evident to all that in viewing their relations thus, the lateral symmetry is apparent and plain, though the assertion is made that the feature of bilaterality seems to be altogether wanting when the valves are thus considered. It seems strange that Mr. Shaler should have overlooked the fact that whether we consider the valves dorsal and ventral, or anterior and posterior, precisely the same imaginary line is drawn, and the same identical valves are made. The statement that the valves are before and behind, I believe to be an incorrect interpretation of the true homological relation which the test bears to the animal; and, furthermore, the manner in which he determines the longitudinal diameter, by passing a plane through the two extremities of the alimentary canal, is, I believe, a misconstruction of these relations.

For the reasons that the terms dorsal and ventral are indiscriminately used in various departments in the animal kingdom, and quite improperly express the regions in mollusca, to which they are generally applied, the dorsal region, which contains the heart, has been designated the Hæmal Region, and the ventral region, which embraces the great nerve-centres, has been called the Neural Region. I shall therefore adopt the terms hæmal and neural, as they more properly express an idea of the parts intended.

In order to appreciate clearly the true longitudinal diameter of the Brachiopoda, we must consider the various members belonging to the order of Polyzoa, to which, without doubt, they are intimately connected; and if we would find the longitudinal diameter of Polyzoa, we have only to compare them with the Ascidian Tunicata. G. J. Allman, in his Monograph of the Fresh-Water Polyzoa, published by the Ray Society, has so clearly pointed out the close homologies existing between the Polyzoa and Tunicata, and illustrated them by excellent diagrams, that it would be doing injustice to him were I to attempt a

résumé in the limited space of this paper. Suffice it to say, he shows clearly the homological relations between the two orders in the structural affinities between the branchial sac of the Tunicata and the palpi of the Polyzoa, in the relative position of the organs of nutrition, the opening and termination of the intestinal tube, and in the relative position of the nervous ganglion, and finally the corresponding structure of their outer envelopes. He figures a Clavalina-like Tunicate, and a Plumatella-like Polyzoon; in his relative comparisons he has placed figures of the two side by side in the natural position in which they are found. The longitudinal diameter in both is a line drawn from the base of attachment through the body and parallel with the sides of the animal. To homologize the Lamellibranchiates with the Tunicates, we have only to compare the common Mya with an Ascidian, and the relation between the syphonal tube of the one with the incurrent and excurrent orifices of the other will be obvious at once; and an anatomical investigation of the two animals will render these relations still more apparent. Now, in order to obtain the longitudinal diameter in the Brachiopoda, we must follow the connection between typical forms of this order with members of the order of Polyzoa; look at the simplest Polyzoon where the investing sac is a mere tube; we have no appendage to the cell-wall developed, though its bilaterality is plainly expressed in the horse-shoe shaped lophophore; but, as we advance, we find, on the hæmal side or region of the animal, as in Loricula and Eucratea, a lid developed, called the operculum, which is strictly homologous with the hæmal valve of the Brachiopoda. In the Lepralia and Flustra-like forms, this lid assumes more importance, and the homologies of the retractor muscles of this lid with corresponding muscles in Terebratula have been clearly pointed out by Huxley. If we lay one of these Loricula-like forms in a normal position, do we not find that the mouth, with the palpi, is at the free end of the body, as in Terebratula, while the other end, that is, the neural portion of the cell, is attached precisely as we find in Terebratula?

To make the case still more intelligible, let us compare the articulation of the cell and operculum of a Cheilostomatous Polyzoon or the two valves of an Avicularia with the two valves of the typical Brachiopoda. The two valves in the latter case are articulated in the same manner as obtains in the valves of a Polyzoon or in the valves of an Avicularia. The shell of Brachiopoda consists of two valves, — one large, through which the peduncle passes for attachment, the other small, — which homologize with the larger and lesser valves of Polyzoa. So, also, does the termination of the intestine turn from the smaller valve in Terebratula as in the Polyzoon cited above. Thus the brachial arms of the one are in strict homological

relation with the lophophore of a Hippocrepian Polyzoon. As we ascend to the Brachiopoda, we behold with interest the increasing prominence and enlargement of the hæmal valve, and at the same time a more limited movement of the palpi, which, in the lower forms, can be extended free of the cell; but as we approach Terebratula through Lingula, we observe less mobility of the hæmal valve, and a restricted movement of the brachial arms. Let us examine Lingula, which is quite long, flat, and broad, and we find the mouth pointing toward the open part of the valves, as in the Polyzoa, on each side of which is coiled a brachial arm identical with the lophophore of Polyzoa in junction and position. We find the intestine also running parallel with the sides of the body, at its posterior portion becoming convoluted and terminating on the right side, the straight part producing a curve arching toward the hæmal valve and surmounted by a heart as we witness in most Lamellibranchiata; showing clearly in this view alone its homological identity with the Lamellibranchiata. In Terebratula the curvature of the intestine is still greater, as the shell is made shorter and more inflated, and consequently the mouth is forced back to admit room for the coiled brachial arms, and the intestine is seen abruptly bent in an almost vertical plane, arching toward the hæmal valve, and apparently trending across the body from one valve to another.

The limits of this paper will not allow us to carry homologies from this point to the other two classes of mollusca, and in fact it would be hardly necessary to do so, as the path is rendered apparent and plain through the medium of Lamellibranchiates.

Mr. T. T. Bouvé exhibited a poisonous snake, which had been taken alive from a pile of wood brought from the west coast of Africa more than a year ago.

Mr. F. W. Putnam stated that it was a poisonous snake belonging to the genus Elaps. It was a representative of a species that he had never seen before. It differed from the *Elaps fulvius* of the Southern States by the greater number and smaller size of the black rings on the body. There have been several species of the genus described from South America.

Mr. Putnam made a few remarks upon snakes in general, saying that he had of late been engaged in cataloguing the Reptiles in the Museum of Comparative Zoölogy; and that in the course of this work he had found it necessary to make several changes in the classification of North American snakes, as given by Messrs. Baird and Girard in their cata-